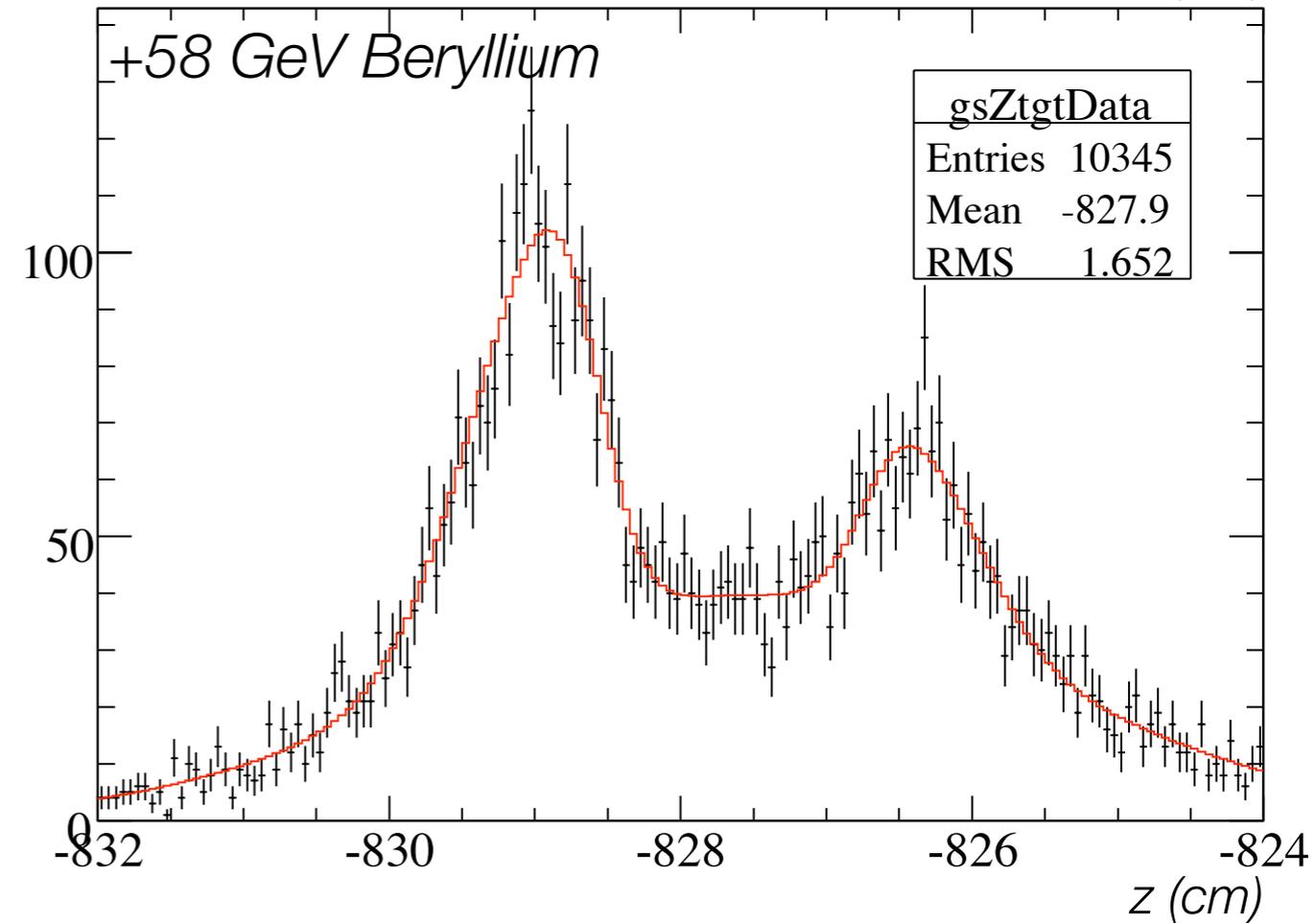
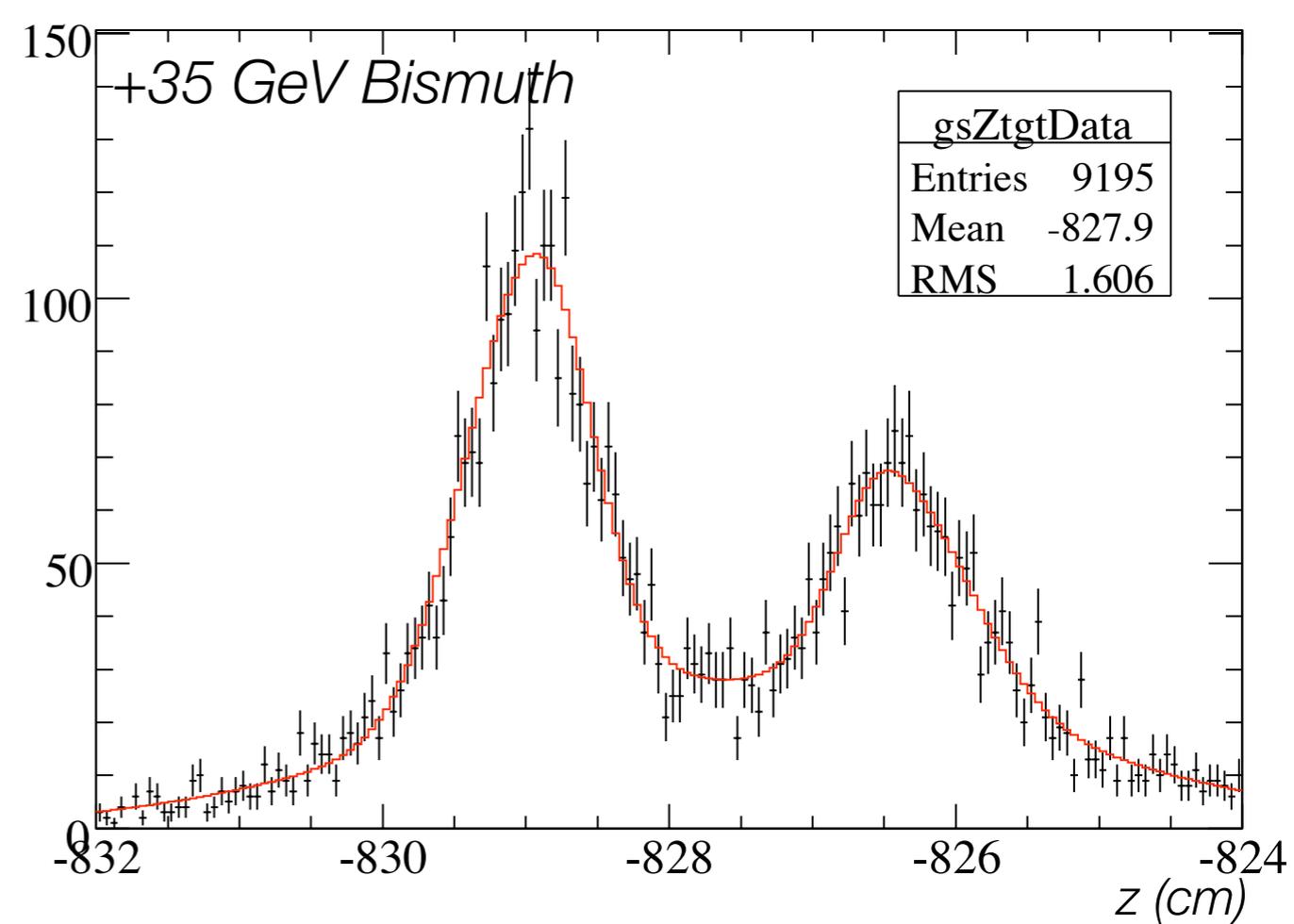
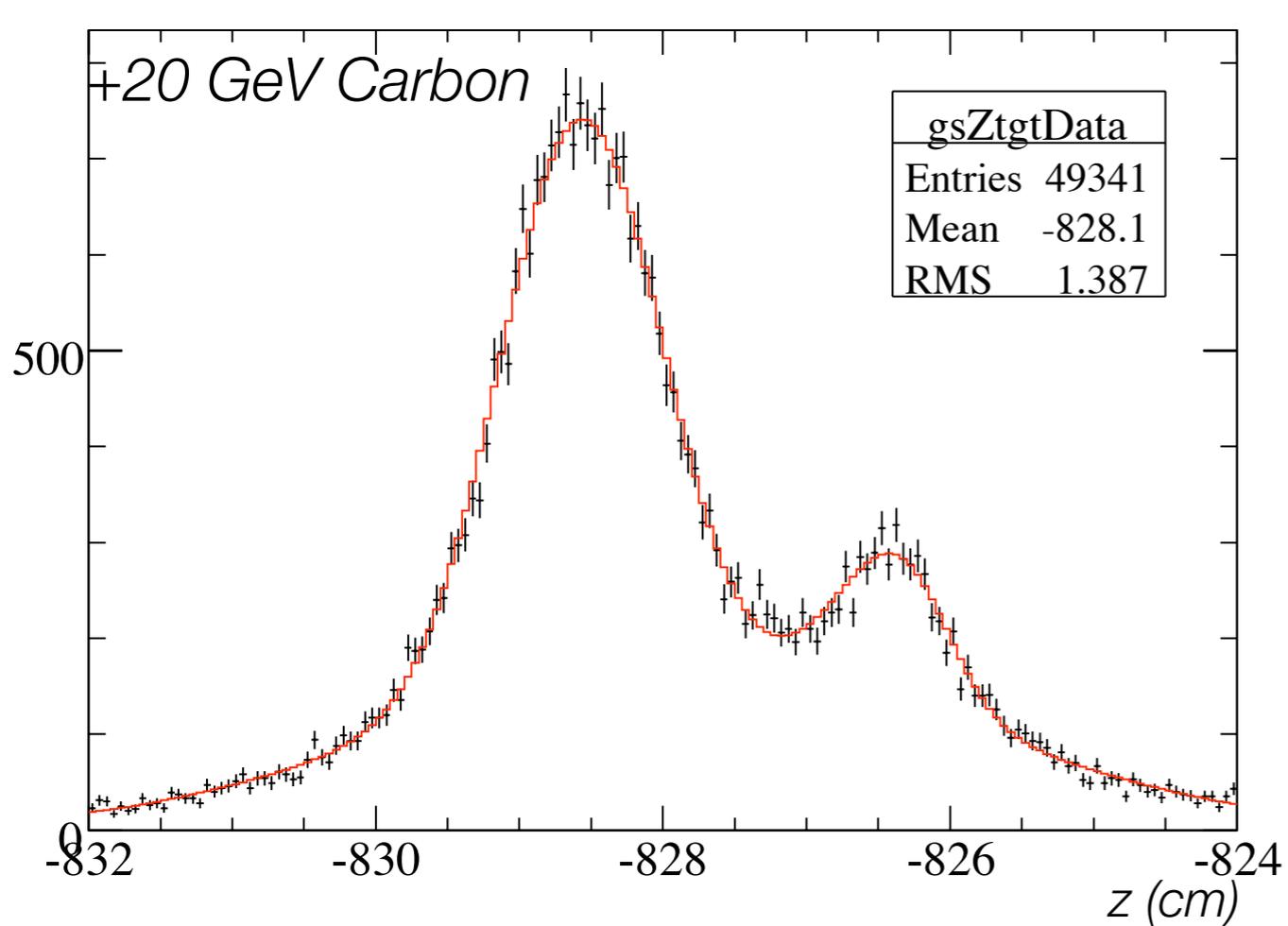


Measuring target and scint positions

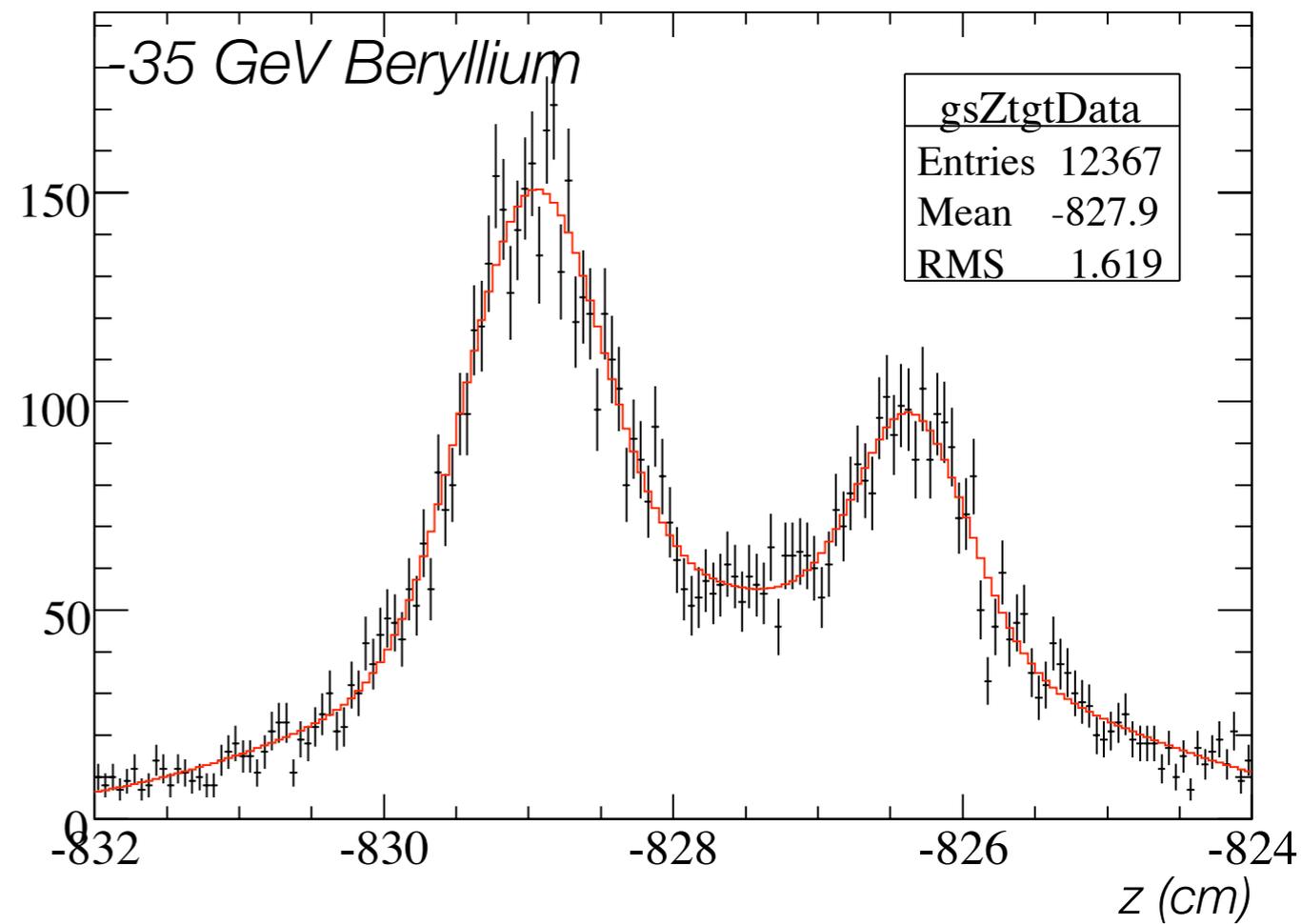
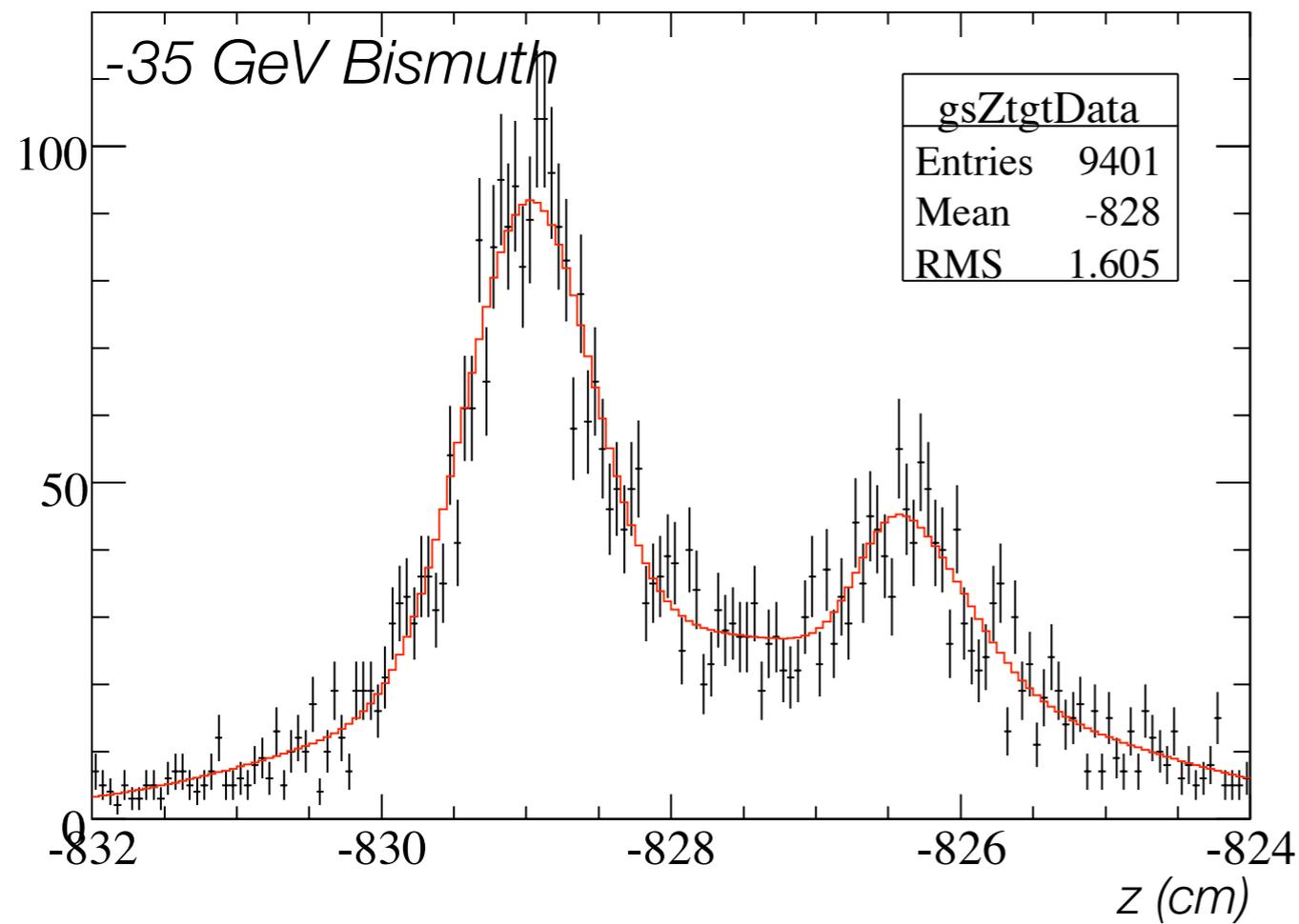
Mark Messier
4 OCT 2007

Summary

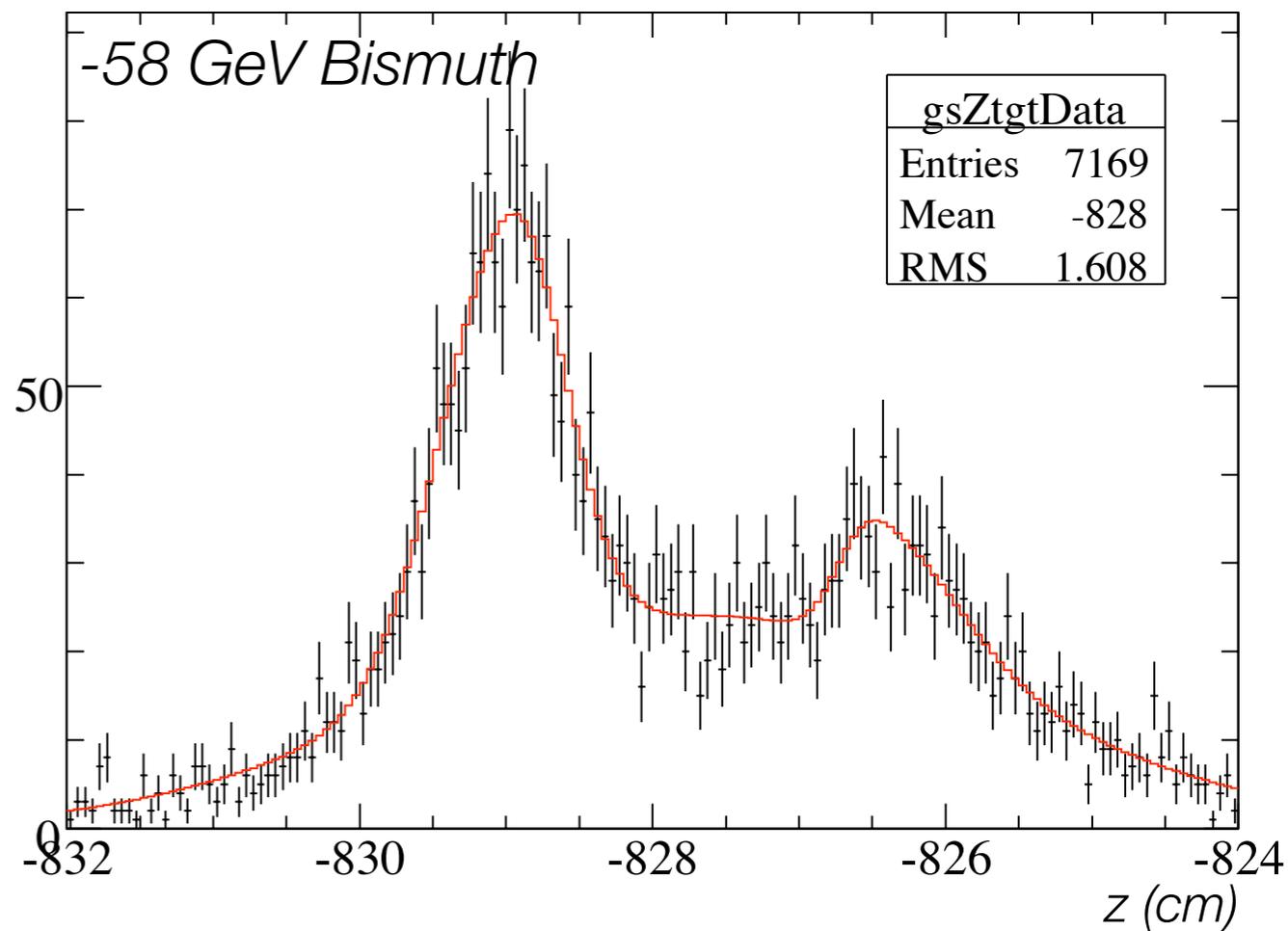
- Last week I showed evidence that perhaps we have the scint counter position incorrect in the geometry
- Since then, I have looked at the vertex z distributions for interactions with 3 or more tracks using several sets of thin target data spanning many targets and momenta. Sets were analyzed separately for the runs 13000-14000 epoch and the 15000-16000 epoch
- The target z positions were fit to a convolution of step functions for the target mass distribution with a asymmetric gaussian resolution functions. The parameters of the fit are:
 - 1) Z_{tgt} - position of upstream edge of target
 - 2) W_{tgt} - target width. Held fixed according to database
 - 3) Z_{scint} - position of upstream edge of scint counter
 - 4) W_{scint} - scint. counter width. Held fixed according to as-built width
 - 5) A_{tgt}, A_{scint} - normalization constants for target and scint vertices
 - 6) $\sigma_{TGT,Up}$ - upstream gaussian sigma for vertices in target material
 - 7) $\sigma_{TGT,Dn}$ - down-stream gaussian sigma for vertices in target material
 - 8) $\sigma_{SCI,Up}$ - upstream gaussian sigma for vertices in scint material
 - 9) $\sigma_{SCI,Dp}$ - down-stream gaussian sigma for vertices in scint material
 - 10) $A_{BKG}, Z_{BKG}, \sigma_{BKG}$ - parameters for gaussian distributed backgrounds

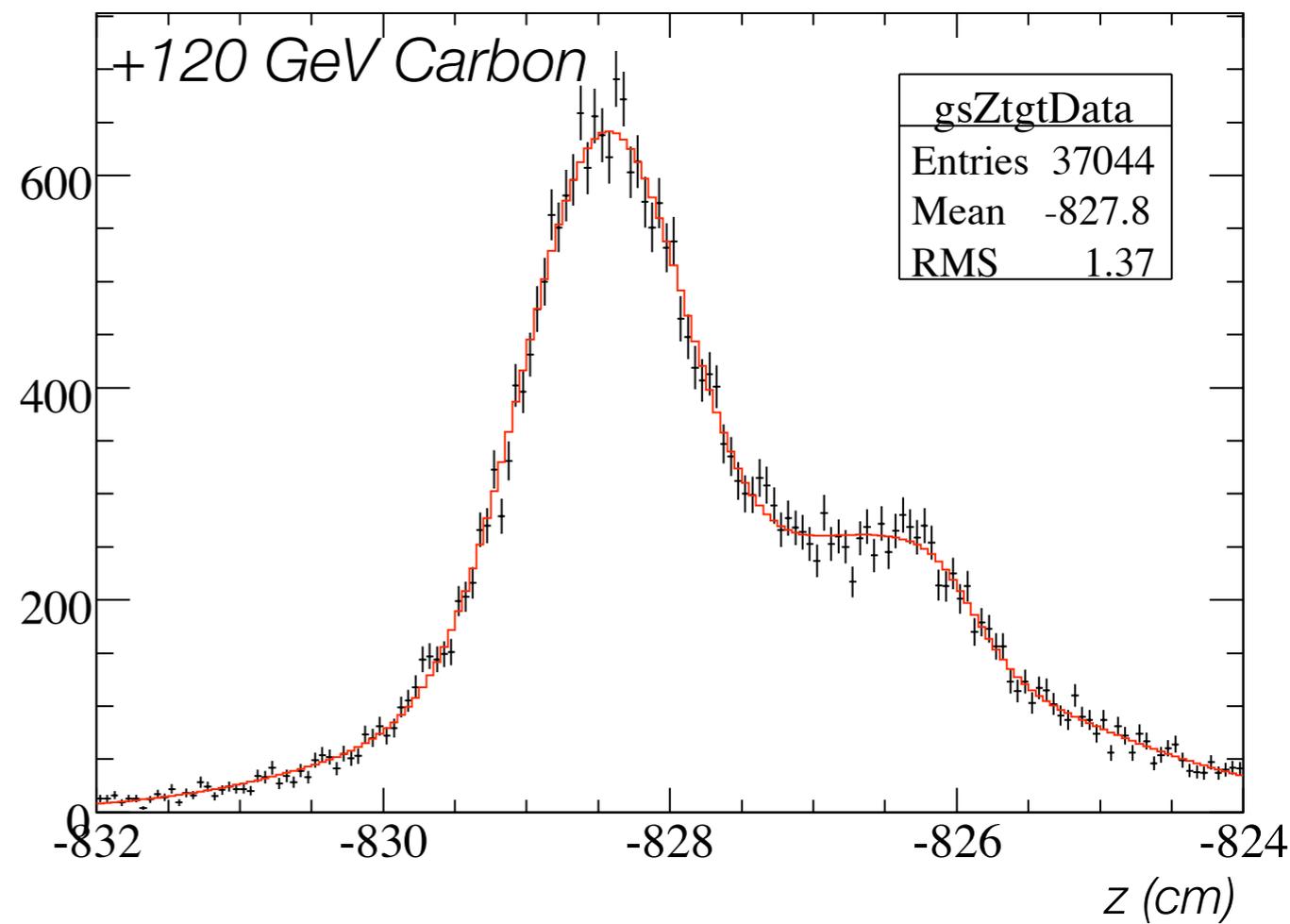
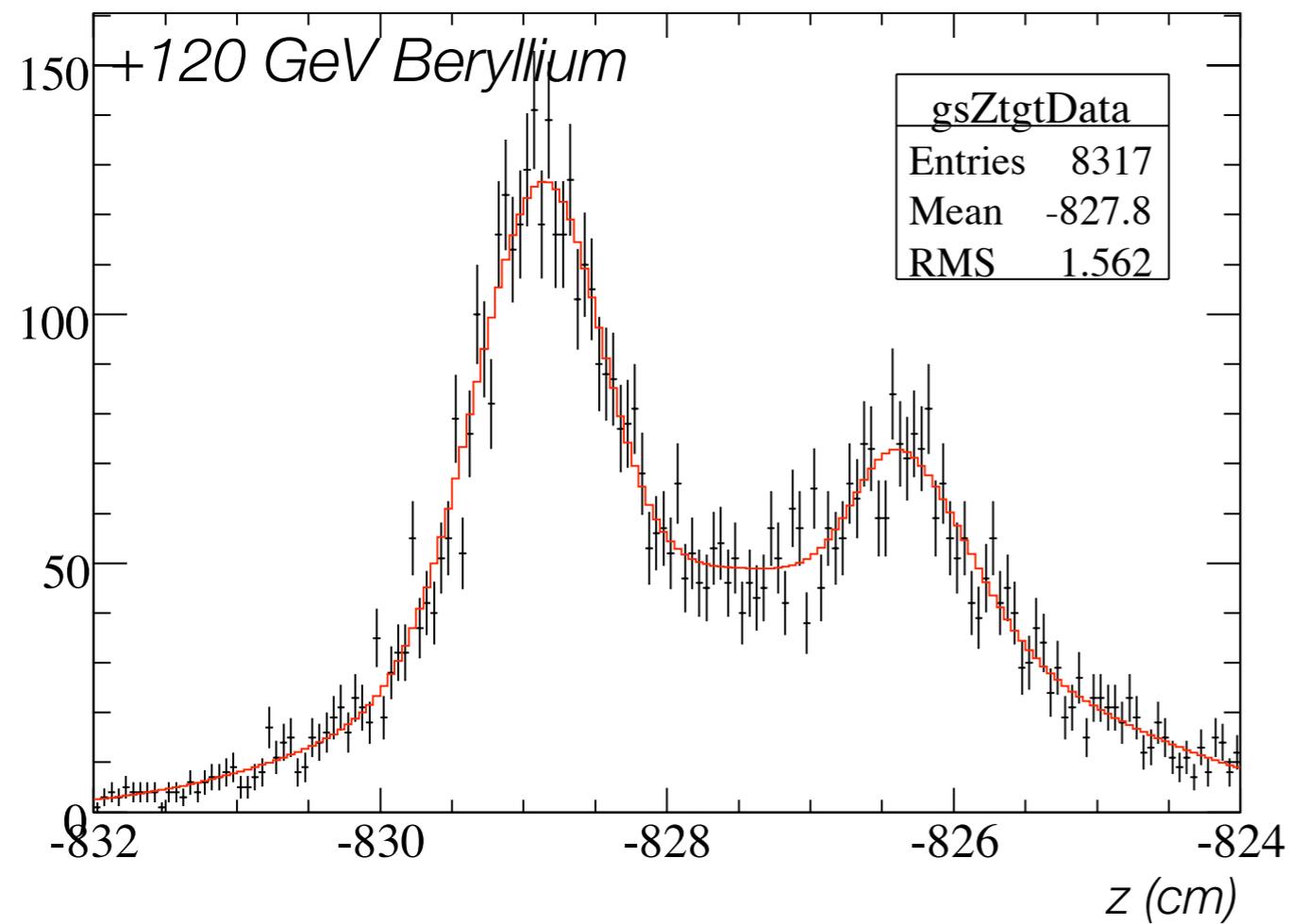


Positive runs from the
13000-14000 epoch

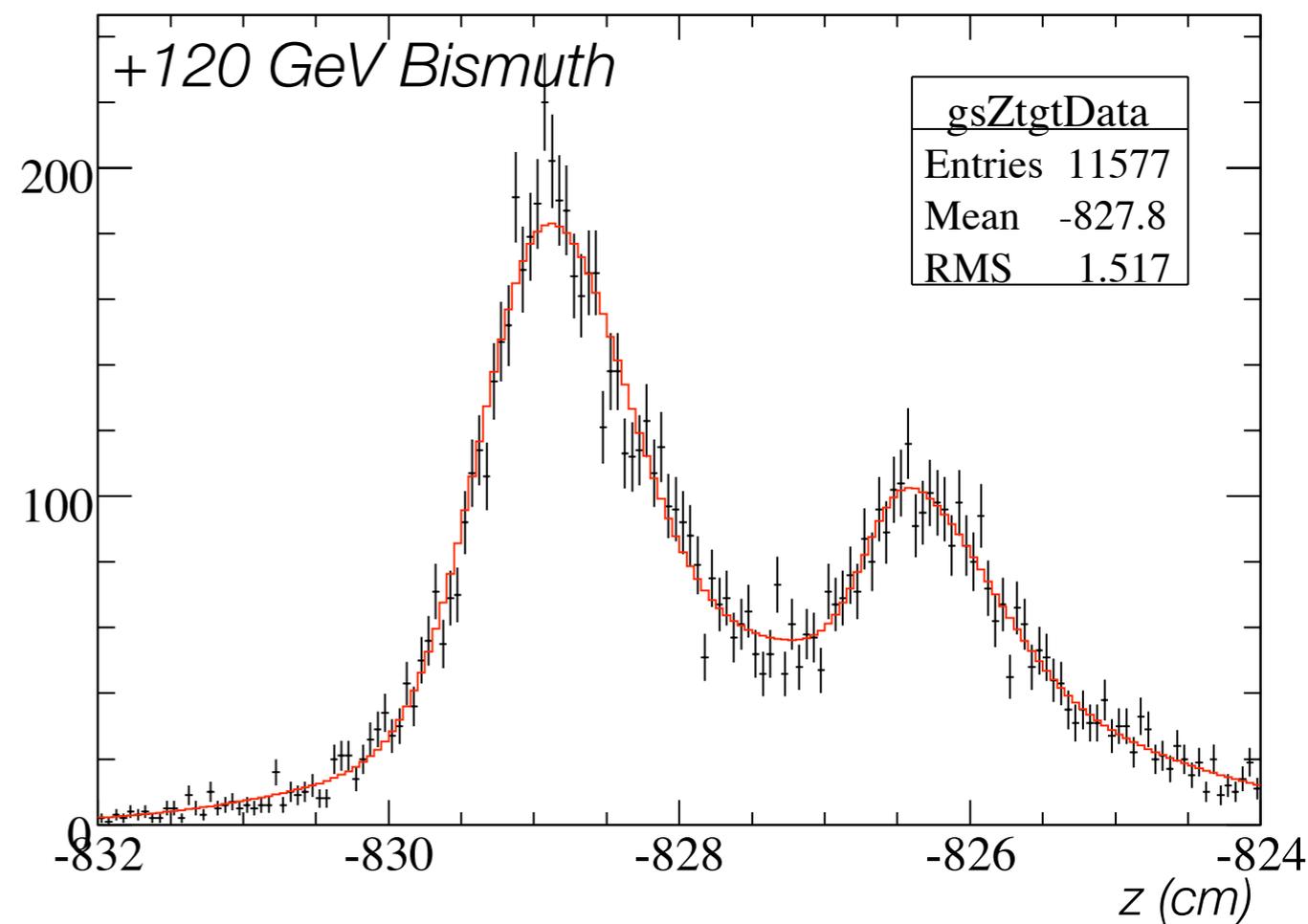


Negative runs from the
13000-14000 epoch





+120 GeV runs from the
15000-16000 epoch



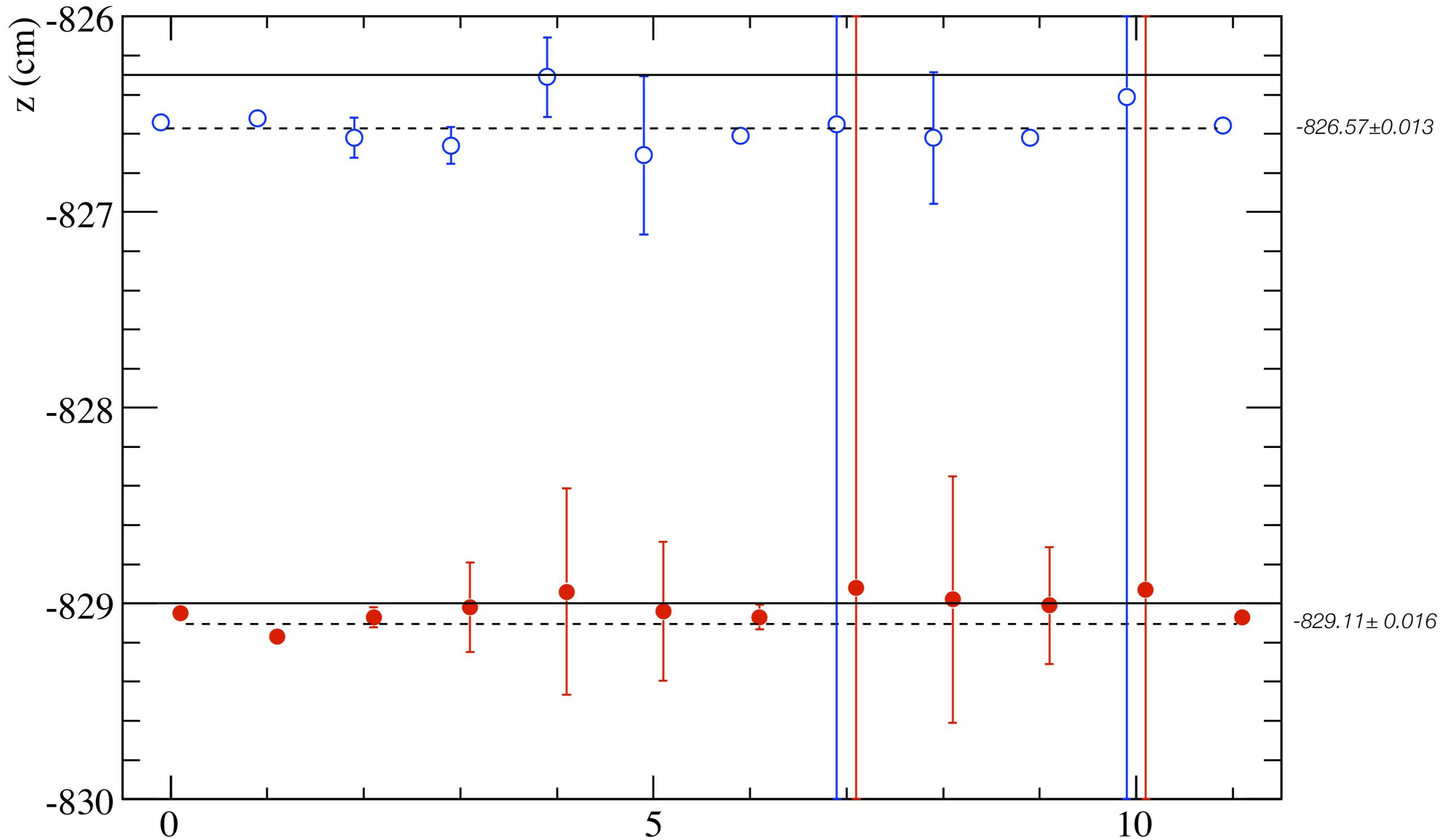
Tabular summary of fit results (all units cm)

id	Which	Width	Ztgt	error	Zscint	error	sigma TGT,UP	sigma TGT,DN	sigma SCI,UP	sigma SCI,DN	TgtZ- Nominal	ScintZ- Nominal
0	c+20gev-13-14.root	1.00	-829.05	0.006	-826.54	0.018	0.48	0.43	0.40	0.33	-0.05	-0.24
1	be-35gev-13-14.root	0.40	-829.17	0.004	-826.52	0.028	0.45	0.46	0.35	0.38	-0.17	-0.22
2	bi-35gev-13-14.root	0.17	-829.07	0.008	-826.62	0.073	0.44	0.42	0.24	0.45	-0.07	-0.32
3	bi+35gev-13-14.root	0.17	-829.02	0.036	-826.66	0.067	0.48	0.38	0.32	0.54	-0.02	-0.36
4	be-58gev-13-14.root	0.40	-828.94	0.083	-826.31	0.146	0.54	0.24	0.29	0.24	0.06	-0.01
5	bi-58gev-13-14.root	0.17	-829.04	0.056	-826.71	0.290	0.47	0.35	0.18	0.57	-0.04	-0.41
6	be+58gev-13-14.root	0.40	-829.07	0.010	-826.61	0.030	0.55	0.27	0.29	0.47	-0.07	-0.31
7	c+58gev-13-14.root	1.00	-828.92	5.426	-826.55	5.903	0.63	0.26	1.36	0.46	0.08	-0.25
8	bi+58gev-13-14.root	0.17	-828.98	0.099	-826.62	0.241	0.59	-0.45	-1.93	-0.99	0.02	-0.32
9	bi+120gev-15-16.root	0.17	-829.01	0.047	-826.62	0.018	0.45	0.54	0.24	0.56	-0.01	-0.32
10	c+120gev-15-16.root	1.00	-828.93	5.422	-826.41	5.911	0.48	0.42	0.98	0.32	0.07	-0.11
11	be+120gev-15-16.root	0.40	-829.07	0.005	-826.56	0.018	0.46	0.38	0.29	0.45	-0.07	-0.26


 -829.0 nominal -826.3 nominal

Weighted mean target shift = 0.07 cm
 Weighted mean scint shift = -0.19 cm

For reference: width of scintillator counter is $(1/8+8*0.004)*2.54$ cm = 0.40 cm



- *Red closed circles*: Fitted upstream edge of target
- *Blue open circles*: Fitted upstream edge of scint counter
- *Dashed lines*: Best fit results to all data sets
- *Solids lines*: Nominal positions from geometry tables

Summary

- I see no systematic difference in the target/scint geometry between the 13000-14000 epoch and the 15000-16000 epoch. All targets and all momenta give consistent results.
- Fitted target positions and nominal target positions agree to within 1 mm
- Fitted scint positions and nominal scint positions differ by 2 mm. Fitted position is roughly 2 mm upstream of nominal. This is suspiciously close to 1/2 the width of the scint counter.
- To do:
 - Decide if this scint shift is real. If yes, then update the geometry tables
 - Make a systematic check of TPC residuals. If there seems to be no problems, then it is likely that the systematic distortions I've been seeing were due to an incorrect target constraint. In this case, we can drop TPCResCor.
 - If there are systematic corrections that can be made to the TPC hit positions, then re-generate ResCor maps using the correct scint position.